

WHAT IS CLAIMED IS:

1. A joint device for connecting and separating an ink tank capable of taking in an ink through an ink intake port
5 to and from ink supply means connected to said ink intake port to take said ink from a refilling tank in said ink tank, characterized by comprising:

a supply pipe having an ink supply port disposed therein;

10 closing means composed of an elastic member, for opening and closing said ink supply port;

deformation means for deforming said closing means;
and

15 urging means for urging said deformation means.

2. The joint device according to claim 1, characterized in that said deformation means operates during a connection operation in such a manner as to relieve the deformation of said closing means and then slide over said supply pipe.
20

3. The joint device according to claim 1, characterized in that said closing means has a sucker-shaped portion additionally formed therein and which is sufficiently deformed to allow said deformation means to operate.
25

4. The joint device according to claim 1, characterized in that recesses and projections are formed near said ink

intake port so that said sucker-shaped portion is deformed in such a manner as to rub against said recesses and projections.

5 5. An ink jet recording apparatus having an a joint device for connecting and separating an ink tank capable of taking in an ink through an ink intake port to and from ink supply means connected to said ink intake port to take said ink from a refilling tank in said ink tank, characterized by
10 comprising:

a supply pipe having an ink supply port disposed therein;

closing means composed of an elastic member, for opening and closing said ink supply port;

15 deformation means for deforming said closing means; and

urging means for urging said deformation means.

6. The ink jet recording apparatus according to claim
20 5, characterized in that said deformation means operates during a connection operation in such a manner as to relieve said deformation of said closing means and then slide over said supply pipe.

25 7. The ink jet recording apparatus according to claim 6 characterized in that said closing means has a sucker-shaped portion additionally formed therein and

which is sufficiently deformed to allow said deformation means to operate.

8. The ink jet recording apparatus according to claim
5 7, characterized in that recesses and projections are formed near said ink intake port so that said sucker-shaped portion is deformed in such a manner as to rub against said recesses and projections.

10 9. An ink jet recording apparatus comprising an ink tank capable of taking in an ink through an ink intake port and ink supply means capable of taking an ink from a refilling tank in the ink tank by means of negative pressure introduced into the ink tank through a suction port therein,
15 characterized in that: said suction port has gas-liquid separating means for transmitting gases therethrough while not transmitting said ink therethrough.

10. The ink jet recording apparatus according to claim
20 9, characterized in that said gas-liquid separating means is selected from polytetrafluoroethylene and similar porous resin materials which transmit gases therethrough while not transmitting liquids therethrough.

25 11. An ink jet recording apparatus that can record an image on a recorded medium using an ink jet recording head capable of ejecting an ink supplied from an ink tank, characterized

by comprising:

negative-pressure introducing means capable of introducing negative pressure into said ink tank;

ink supplying means for capable of supplying said ink
5 to an interior of said ink tank using said negative pressure in said ink tank;

gas-liquid separating means provided in a negative-pressure introducing path located between said ink tank and said negative-pressure introducing means, for
10 transmitting gases therethrough while not transmitting said ink therethrough; and

isolation means capable of separating a middle site of said negative-pressure introducing path located between said gas-liquid separating means and said
15 negative-pressure introducing means.

12. The ink jet recording apparatus according to claim 11, characterized in that said gas-liquid separating means is supported by said ink tank and is movable between at
20 least two positions including a first position used while said ink is not supplied and a second position used during an ink supply.

13. The ink jet recording apparatus according to claim
25 11, characterized in that said isolation means has a connection portion to which the middle site of said negative-pressure introducing path is separably

connected.

14. The ink jet recording apparatus according to claim
11, characterized in that said ink jet recording apparatus
5 has movement means for moving said ink tank so that when
said ink tank moves to a predetermined ink supplying
position and a predetermined home position, said isolation
means connects the middle site of said negative-pressure
introducing path to said ink tank and so that when said
10 ink tank moves away from said ink supplying position and
said home position, said isolation means isolates the
middle site of said negative-pressure introducing path
from said ink tank.

15 15. The ink jet recording apparatus according to claim
11, characterized in that said ink jet recording apparatus
has movement means for moving said ink tank so that when
said ink tank moves to a predetermined ink supplying
position, said isolation means connects the middle site
20 of said negative-pressure introducing path to said ink tank
and so that when said ink tank moves away from said ink
supplying position, said isolation means isolates the
middle site of said negative-pressure introducing path
from said ink tank.

25

16. The ink jet recording apparatus according to claim
11, characterized in that when said ink tank moves away

from said ink tank supply position, said gas-liquid separating means is driven to said first position and in that when said ink tank moves to said ink tank supply position, said gas-liquid separating means is driven to
5 said second position.

17. The ink jet recording apparatus according to claim 11, characterized in that while said gas-liquid separating means is being driven between said first and second
10 positions, a part of said negative-pressure introducing path is in communication with the atmosphere.

18. The ink jet recording apparatus according to according to claim 14, characterized in that said movement means
15 moves said ink jet recording head together with said ink tank.

19. The ink jet recording apparatus according to claim 11, characterized in that said gas-liquid separating means
20 is a gas-transmitting film composed of polytetrafluoroethylene or a similar porous resin material.

20. The ink jet recording apparatus according to claim 11, characterized in that said gas-liquid separating means
25 is a gas-transmitting film composed of porcelain, unglazed pottery, ceramic, or a similar porous material.

21. The ink jet recording apparatus according to claim 11, characterized in that said gas-liquid separating means undergoes an oil-repelling process.

5

22. The ink jet recording apparatus according to claim 11, characterized in that said ink jet recording head has an electrothermal converter for generating thermal energy as energy required to eject said ink.

10

23. An ink supplying device, characterized by comprising:
negative-pressure introducing means capable of
introducing negative pressure into said ink tank;

15 ink supplying means for capable of supplying said ink
to an interior of said ink tank using said negative pressure
in said ink tank;

gas-liquid separating means provided in a
negative-pressure introducing path located between said
ink tank and said negative-pressure introducing means, for
20 transmitting gases therethrough while not transmitting
said ink therethrough; and

isolation means capable of separating a middle site
of said negative-pressure introducing path located
between said gas-liquid separating means and said
25 negative-pressure introducing means.

24. The ink supplying device according to claim 23,

characterized in that said gas-liquid separating means is supported by said ink tank and is movable between at least two positions including a first position used while said ink is not supplied and a second position used during an
5 ink supply.

25. The ink supplying device according to claim 23, characterized in that said isolation means has a connection portion to which the middle site of said negative-pressure
10 introducing path is separably connected.

26. The ink supplying device according to claim 23 characterized in that said ink supplying device has movement means for moving said ink tank so that when said
15 ink tank moves to a predetermined ink supplying position and a predetermined home position, said isolation means connects the middle site of said negative-pressure introducing path to said ink tank and so that when said ink tank moves away from said ink supplying position and
20 said home position, said isolation means isolates the middle site of said negative-pressure introducing path from said ink tank.

27. The ink supplying device according to claim 23,
25 characterized in that said ink supplying device has movement means for moving said ink tank so that when said ink tank moves to a predetermined ink supplying position,

said isolation means connects the middle site of said negative-pressure introducing path to said ink tank and so that when said ink tank moves away from said ink supplying position, said isolation means isolates the middle site of said negative-pressure introducing path from said ink tank.

28. The ink supplying device according to claim 23, characterized in that when said ink tank moves away from said ink tank supply position, said gas-liquid separating means is driven to said first position and in that when said ink tank moves to said ink tank supply position, said gas-liquid separating means is driven to said second position.

15

29. The ink supplying device according to claim 23, characterized in that while said gas-liquid separating means is being driven between said first and second positions, a part of said negative-pressure introducing path is in communication with said atmosphere.

30. The ink supplying device according to claim 23, characterized in that said gas-liquid separating means is a gas-transmitting film composed of polytetrafluoroethylene or a similar porous resin material.

31. The ink supplying device according to claim 23, characterized in that said gas-liquid separating means is a gas-transmitting member composed of porcelain, unglazed pottery, ceramic, or a similar porous material.

5

32. The ink supplying device according to claim 23, characterized in that said gas-liquid separating means undergoes an oil-repelling process.

10 33. An ink supplying method characterized in that said method includes negative-pressure introducing means, gas-liquid separating means provided in a negative-pressure introducing path capable of introducing a negative pressure into an ink tank, said gas-liquid
15 separating means transmitting gases therethrough while not transmitting inks therethrough, and isolation means provided in a middle site of said negative-pressure introducing path located between said gas-liquid separating means and said negative-pressure introducing
20 means, said isolation means being capable of isolating the middle site, in that when said ink tank moves to a predetermined ink supplying position and a predetermined home position, the middle site of said negative-pressure introducing path is connected, in that when said ink tank
25 moves to said ink supplying position, said gas-liquid separating means is located at said second position and the negative pressure is introduced into said ink tank

through said negative-pressure introducing path, so that the ink is supplied to an interior of said ink tank using the negative pressure in said ink tank, in that when or after the ink comes into contact with said gas-liquid separating means, said gas-liquid separating means stops introducing the negative pressure into said ink tank, in that when said ink tank leaves said ink supplying position and said home position, the middle site of said negative-pressure introducing path is isolated, and in that when said ink tank leaves said ink supplying position, said gas-liquid separating means is located at said first position.

34. An ink supplying method characterized in that said method includes gas-liquid separating means provided in a negative-pressure introducing path capable of introducing a negative pressure into an ink tank, said gas-liquid separating means transmitting gases therethrough while not transmitting inks therethrough, and isolation means provided in a middle site of said negative-pressure introducing path located between said gas-liquid separating means and said negative-pressure introducing means, said isolation means being capable of isolating the middle site, in that when said ink tank moves to a predetermined ink supplying position, the middle site of said negative-pressure introducing path is connected, said gas-liquid separating means is located at said second

position, and said negative pressure is introduced into
said ink tank through said negative-pressure introducing
path, so that the ink is supplied to an interior of said
ink tank using the negative pressure in said ink tank, in
5 that when or after the ink comes into contact with said
gas-liquid separating means, said gas-liquid separating
means stops introducing the negative pressure into said
ink tank, in that when said ink tank leaves said ink
supplying position, the middle site of said negative-
10 pressure introducing path is isolated and said gas-liquid
separating means is located at said first position.